SAMPLING FOR RESIDUES OF FENAMIPHOS, FENAMIPHOS SULFOXIDE AND FENAMIPHOS SULFONE IN WELL WATER

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State of California
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SAMPLING FOR RESIDUES OF FENAMIPHOS, FENAMIPHOS SULFOXIDE AND FENAMIPHOS SULFONE IN WELL WATER

BY JOHN TROIANO, BONNIE TURNER, AND NANCY MILLER

DECEMBER, 1987

FIELD MONITORING: JACOB ANIKU, NANCY CARR, CINDY GARRETSON, JOEY MARADE JOHN SITTS, AND KAREN WIESE

CHEMICAL ANALYSES: VINCENT QUAN

ABSTRACT

A well sampling survey was conducted to determine the presence of fenamiphos, fenamiphos sulfoxide, and fenamiphos sulfone in ground water. Wells were sampled in areas where use of fenamiphos coincided with areas of previous contamination by other pesticides. This was possible because fenamiphos is a restricted use pesticide so a spatial record of use was available and the CDFA's Well Inventory Data Base contains spatial locations of historical pesticide detections in well water. Twenty-four wells were sampled in 16 sections in Fresno County, 12 wells were sampled in 8 sections in San Joaqiun County and 5 wells were sampled in 3 sections in Kern County. No residues of fenamiphos or its sulfoxide and sulfone metabolites were detected in any of the samples. These results may be due either to fenamiphos's environmental fate or to current use patterns. With respect to environmental fate, the soil half-life of fenamiphos and its metabolites may be short enough to allow for degradation before recharge into ground water occurs. Alternatively, the total use of fenamiphos may not yet be great enough to allow for detection of residues: the average use per section was only 0.14 lbs active ingredient/acre. This use may be too low for detection of residues at current minimum detection limits.

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INTRODUCTION

The California Department of Food and Agriculture (CDFA), under the auspices of the Pesticide Contamination Prevention Act (AB2021), is required to sample well water for residues of pesticides that are potential ground water contaminants. Fenamiphos is a nematicide that has recently been submitted into the AB2021 hearing process. Residues of fenamiphos had been detected below 8 feet in soil cores taken from lily bulb fields in Del Norte County where it was superseding use of aldicarb for control of nematodes (personal communication, Don Weaver, Environmental Hazards Assessment Program, CDFA). To date, no residues of fenamiphos or its break-down products have been detected in well water samples taken near the Del Norte soil coring sites or in other areas of California (Brown et. al., 1986).

Agricultural use of fenamiphos is currently permitted under section 18 of the FIFRA code in areas of the Central Valley where contamination of well water by other pesticides had previously been found. This study was initiated to determine whether or not residues of fenamiphos or its break-down products, fenamiphos sulfoxide and fenamiphos sulfone, were present in well water samples specifically taken from areas where previous contamination was found. Since fenamiphos is a restricted use compound, locations of sampling sites were determined from spatial location of use as indicated from the Pesticide Use Information Data Base (personal communication, Information Services, CDFA) and from local Agricultural Commissioner records.

MATERIALS AND METHODS

Study design

An initial review of data from the Pesticide Use Information Data Base indicated two patterns of use for the 1983-1985 period: one in Kern County where the combined application of the nematicide exceeded 7140 lb active ingredient (ai) in only four sections; the second type occurred in Fresno, San Joaquin, and Tulare counties where total amounts used were lower but applications occurred in numerous sections. From this information, the projected study was designed to include 42 wells from those four counties representing high and low density areas of fenamiphos use.

To insure that samples represented ground water, only wells that were cased and sealed were to be sampled. After investigation of the Department of Water Resources (DWR) well log inventories in the Central and San Joaquin district offices, it was determined that there was an insufficient number of acceptable wells to attain the initial design. Data for the amount of fenamiphos used in the 1986 and 1987 seasons were then examined to locate additional areas of use in Kern, Fresno, and San Joaquin counties. DWR well logs were again searched for suitable sampling wells (Table 1).

The wells chosen for sampling in Fresno and San Joaquin counties were selected based on the following criteria:

Table 1. Location and amount of fenamiphos applied from 1983-87 with number of wells available for sampling in each section.

County and Twnshp	Rng	Sec	Lb AI 1983-87	No. of Wells*
Fresno				
14S	21E	1	932	11
		16	304	5
		22	88	2
		26	348	4
		11	45	-
		27	164	-
		28	98	-
		35	9	-
		36	60	-
15S	21E	17	304	1
		34	133	5
		2	163	5
		5	174	6
		1	3	-
		3	48	-
		7	5	-
		8	30	-
		14	30	-
		15	30	-
		18	203	-
		20	60	-
		25	315	-
		32	269	-
		33	180	-
San Joaquin				
3N	6E	7	490	1
		10	152	1
		17	219	2
		26	2040	5
3N	7E	8	175	1
		10	220	1
		15	405	2
		18	453	1
		19	180	5
4N	6E	14	555	1
4N	7E	16	200	1
		20	178	1
		22	770	1
		27	336	1
Fresno				
14S	22E	10	202	1
		28	284	3
		16	665	3
		19	101	8
		30	90	2
		12	30	-
		32	90	-
		33	90	-
		35	92	-
15S	22E	20	117	6
		26	167	2
		30	171	3
		33	180	3
		3	318	-
		27	34	-
Kern				
31S	30E	7	171	-
		9	225	-
		21	240	-
		28	123	-
		29	730	2
		31	4285	2
		32	353	-
32S	28E	13	4970	1
		26	1261	-
32S	29E	21	135	-
		27	1011	-
		28	408	-
		35	543	-

*Suitability determined by criteria listed in study design section of report.

1. Suitability of well for sampling which included type of drilling method, well sealing method, depth of grout seal, and depth of perforations.

2. Amount of fenamiphos applied during the past 5 years and proximity of application to the well site.

3. Depth to ground water in the area surrounding the well.

4. Permission by owner to sample well.

In Kern County, wells were chosen using the second through fourth criteria because no suitable well sites could be identified in DWR files. When feasible, drilling and construction information was obtained from those well owners.

Twenty-four wells were sampled in 16 sections in Fresno County located approximately 10-15 miles southeast of Fresno. In San Joaquin County, 12 wells were sampled in 8 sections in the Lodi area and in Kern County, 5 wells were sampled in 3 sections on two properties located southeast of Bakersfield. Sampling was concentrated in Fresno County because it contained the greatest number of suitable wells.

Sample Collection

Collection of water samples was performed according to standard procedures used in previous studies (Sava, 1986). Latex gloves were worn during collection to prevent cross-contamination of samples. One-liter amber bottles with teflon-lined caps and aluminium foil liners were used to collect and store samples. Two replicates, each consisting of two one-liter bottles, were collected from every well. In addition, two distilled water blanks were prepared at each well site for use in laboratory quality control procedures.

Well pumps were allowed to run a minium of 15 minutes prior to sample collection to evacuate all standing water present in the casing. In most instances, the sampling port consisted of a Schrader valve located next to the well head, preceding the tank. Tubing was inserted into the sampling port and the sample was directed into each bottle with little or no exposure to ambient conditions. The bottles were immediately placed on ice and kept in coolers for shipment to the laboratory for chemical analysis.

Photographs were taken to document conditions at the wellhead. Any unusual conditions such as empty pesticide containers or pump leakage were noted. Well inventory data sheets were compiled and maps were drawn describing each site. Information volunteered by owners concerning pesticide use was noted on the data sheets and a chain of custody form accompanied each sample.

Chemical Analysis

The primary laboratory that conducted the pesticide analysis was the California Department of Food and Agriculture's (CDFA) Chemistry Laboratory Services Branch located in Sacramento, California. Quality control analysis of split samples was conducted by Enseco-California Analytical Laboratory (CAL) located in West Sacramento, California. Each well water sample was analyzed for residues of fenamiphos, fenamiphos sulfoxide, and fenamiphos sulfone. Samples were extracted with methylene chloride and fenamiphos was quantified by gas chromatography (GC) and confirmed by high pressure liquid chromatography (HPLC); fenamiphos sulfoxide and sulfone were quantified by HPLC (Appendix A).

The following quality control procedures were used. For methods development, replicates of blank water samples were spiked (blank matrix spikes) with fenamiphos, fenamiphos sulfoxide and fenamiphos sulfone at 0.5, 2 and 5 ppb. The minimum detection limit was 0.1 ppb for all three chemicals and the percent recoveries ranged from 85% to 130% for fenamiphos, 64% to 160% for fenamiphos sulfoxide, and 40% to 160% for fenamiphos sulfone (Appendix B, Tables B-1, B-2, and B-3). The mean percent recovery and standard deviation (SD) for fenamiphos was 107% and 16.7, for fenamiphos sulfoxide was 109% and 21.8, and for fenamiphos sulfone was 100% and 25.7, respectively (Appendix B, Table B-4). The mean percent recovery and SD were used to calculate the warning and control limits for accuracy; warning limits were set at ±2 SD from the mean and the control limits were set at ±3 SD.

For continuous quality control during analysis one blank matrix and blank matrix spike were analyzed with each extraction set, and confirmation analysis for fenamiphos was conducted by HPLC (Appenidx B, Tables B-5, B-6, and B-7). Only one of the matrix spike recoveries fell outside the upper control limit for fenamiphos sulfoxide (Appendix B, Table B-6). Since method development and sample analysis were completed simultaneously, no corrective action was initiated.

Split sample interlaboratory analyses were conducted on 4 well water samples. All results were non-detected for fenamiphos and its metabolites at detection limits of 0.1 and 0.5 ppb for CDFA and CAL, respectively (Appendix B, Tables B-8, B-9, and B-10).

A storage dissipation study was conducted to measure anticipated breakdown of fenamiphos to its metabolites over the duration of chemical analyses. Nine replicate blank matrix spike samples were prepared on the first day of well sampling, August 1, 1987, each containing 2 ppb of fenamiphos, fenamiphos sulfoxide and fenamiphos sulfone. Three spikes were analyzed with the first set of samples, 3 spikes after 50% of sample analyses was completed and 3 spikes analyzed with the last set of samples. There was no significant breakdown of fenamiphos or its metabolites over the storage period of 29 days (Appendix B, Tables B-11, B-12, B-13).

A set of blind spike samples was submitted to CDFA and Cal. Each set contained one sample spiked with fenamiphos at 1 ppb and one sample spiked

with fenamiphos sulfoxide at 2 ppb. Fenamiphos sulfoxide was detected in samples spiked with fenamiphos by both CDFA and CAL, with 0.1 ppb of fenamiphos sulfone detected in one sample. Samples spiked with fenamiphos sulfoxide had recoveries of 90 and 65% for CDFA and CAL, respectively (Appendix B, Tables B-14 and B-15). CDFA investigated the stability of the fenamiphos standard used during analyses by comparing it to a freshly prepared standard. No evidence of fenamiphos decomposition to its metabolites was measured in either standard.

RESULTS AND DISCUSSION

Well water samples were obtained in three counties: Fresno, San Joaquin, and Kern. No residues of fenamiphos, fenamiphos sulfoxide or fenamiphos sulfone were detected in any of the well water samples. The MDL was 0.1 ppb for each component. The cumulative amount of fenamiphos nematicide that was applied between 1983 and 1987 to a section where water samples were taken, ranged from 30 to 932 lbs ai/section in Fresno County, from 152 to 2,040 lbs ai/section in San Joaquin County and from 543 to 1261 lbs ai/section in Kern County. Four wells were sampled in the sections where highest use was indicated in Fresno and San Joaquin Counties. As noted before, wells in Fresno and San Joaquin Counties were cased and sealed according to DWR records. In Kern County, information was obtained from owners. The estimated depth to ground water in sampled sections ranged from 5-65 feet in Fresno County, 30-95 feet in San Joaquin County and at greater than 100 feet in Kern County (personal communication, DWR). In all cases, the range in depth to perforations in the casings was below the estimated depth to ground water (Table 2).

Overall, the chemical quality control analyses indicated that if fenamiphos residues were present, there would have been a high probability of detection. Recovery was good in the storage dissipation study but it was poor in the blind spike samples. Results of the blind spikes may be suspect because fenamiphos sulfoxide and sulfone were detected in the fenamiphos spiked samples. No such breakdown of fenamiphos was indicated in the other quality assurance studies so the test solutions may have been faulty.

Table 2. Location and number of wells sampled during study. Results of all chemical analyses were non-detected for fenamiphos, fenamiphos sulfoxide and fenamiphos sulfone at a minimun detection limit of 0.1 ppb for all compounds.

County and Twnshp	Rng	Sec	Number of Wells Sampled	Depth to Groundwater (ft)	Perforation Depth Range in Wells(ft)	Cumulative Amount of Fenamiphos Applied Between 1983-87 (lb)
Fresno County						
14S	21E	1	4	20-50	80-156	932
		12	1	35-50	80-100	-
		16	1	35-65	110-140	304
		26	1	30-40	100-120	348
14S	22E	10	1	25-40	60- 80	202
		16	1	20-35	60- 80	665
		28	2	15-30	60-126	284
15S	21E	2	1	5-25	66- 86	163
		5	2	20-35	70-150	174
		8	1	15-30	160-180	30
		17	1	20-35	120-160	304
		34	2	15-30	100-140	133
15S	22E	20	3	20-35	65-125	117
		26	1	25-35	160-200	167
		31	1	10-40	340-560	-
		33	1	15-30	72- 96	180
San Joaquin County						
3N	6E	10	1	30-45	160-500	152
		26	4	45-50	138-220	2040
3N	7E	8	1	60-70	154-204	175
		15	1	70-80	236-248	405
		18	1	55-65	158-168	453
		19	2	55-65	160-200	180
4N	7E	22	1	70-90	Unknown	770
		27	1	45-95	Unknown	336
Kern County						
32S	28E	26	2	>100	Unknown	1261
32S	29E	27	2	>100	487-1191	1011
		35	1	>100	350-906	543
						11329

The lack of positive detections may be related to either the environmental chemical properties of fenamiphos and its metabolites or to fenamiphos agricultural use patterns. With respect to chemical properties, fenamiphos has a short field half-life and rapidly degrades into the more stable fenamiphos sulfoxide. In a study by Lee et. al. (1986), the soil half-life of fenamiphos was around 2 days whereas it was 80 and 16 days for fenamiphos sulfoxide and sulfone, respectively. Thus, fenamiphos may be degraded before recharge into ground water occurs. The pH of the well water samples ranged from approximately 7.0 to 8.0 so breakdown of residues should not have been a problem in this neutral to weakly alkaline range.

Alternatively, the current level of fenamiphos use may be too low to produce detectable residues in ground water. For example, the yearly application rate averaged for all sections included in the study was only 0.14 lbs per acre. An increase in the overall use of fenamiphos could increase the probability of detection.

To date, there is no indication that residues of fenamiphos, fenamiphos sulfoxide or fenamiphos sulfone are present in well water. However, these results may be influenced by the previous use pattern for fenamiphos. The wells in this study should be resampled at a later date to monitor the occurrence of any residues, and the use of fenamiphos again recorded to note any changes in its pattern of applications.

REFERENCES

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Lee, C.-C., R.E. Green and W.J. Apt. 1986. Transformation and adsorption of fenamiphos, f. sulfoxide and f. sulfone in Molokai soil and simulated movement with irrigation. Journal of Contaminant Hydrology, 1:211-215.

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APPENDIX A

CHEMICAL ANALYTICAL METHOD FOR THE ANALYSIS OF FENAMIPHOS, FENAMIPHOS SULFOXIDE, AND FENAMIPHOS SULFONE IN WATER

CALIFORNIA DEPT. OF FOOD & AGRIC.
ENVIRONMENTAL MONITORING SECTION
CHEMISTRY LABORATORY SERVICES
3292 Meadowview Road
Sacramento, CA 95832
(916)427-4998/4999

Original Date:
Supercedes:
Current Date: 12/4/87
Method #:

Method for the Determination of Nemacur, Nemacur sulfoxide and Nemacur sulfone in Water

SCOPE:
This method is for the analysis of Nemacur and its metabolites in water.

PRINCIPLE:
The compounds of interest are extracted from water with methylene chloride. It is then evaporated to dryness and redissolved in ethyl acetate for Nemacur and 20/80 acetonitrile/H_2O for metabolites.

REAGENTS AND EQUIPMENT:
1. Methylene chloride, HPLC grade.
2. Sodium sulfate, anhydrous, reagent grade.
3. Ethyl acetate, HPLC grade.
4. Acetonitrile, HPLC grade.
5. Filter, 0.2 micron.
6. Various glassware.

METHOD:
1. Extract the 1 liter sample with 100 ml CH_2Cl_2 (methylene chloride). Drain the organic layer through a bed of Na_2SO_4 anhydrous into a receiving flask.

2. Repeat 2 more times.

3. Evaporate the combined solvent to approximately 5 ml. Transfer to a graduated centrifuge tube. Evaporate on a steam bath under N_2 or air to dryness. Redissolve with 5 ml of ethyl acetate. A 2 ml portion is removed for Nemacur determination with GC.

4. To the remaining portion (3 ml): evaporate to dryness. Redissolve with 2 ml of 20% acetonitrile (ACN) in water. Pass through 0.2 micron filter for metabolite analysis with HPLC.

Instrument Condition

GC

Column: methyl silicone, 0.53 mm X 10 M
Carrier Gas: Helium 7 psig
Detector: TSD
Temp. Program:

Initial	130°	1 min.
Rate	20°	1 min.
Final	240°	3 min.

Retention Time: aprox. 6 minutes

Instrument Condition, Contd.

LC

Column: C_{18}, 5 micron
Mobile Phase Gradient:

		ACN	H_2O
Equilibration	7 min.	15%	85%
	5 min.	15%	85%
	6 min.	25%	75%
	11 min.	40%	60%
	8 min.	60%	40%
	3 min.	75%	25%

Wavelengths: 225 nanometers
Flow: 1.5 ml/min.
Retention Time:
sulfoxide 17 min.
sulfone 20 min.

CALCULATIONS:
Report data in ppb.

ppb of Nemacur:

$$\frac{(\text{std. ng})}{(\text{ul})} \frac{(\text{pk. height sample})}{(\text{pk. height std.})} \frac{(\text{vol. std. injected})}{(\text{vol. sample injected})} \frac{(5\text{ ml})}{(1000\text{ml})} (1000)$$

ppb of Nemacur sulfoxide and sulfone:

$$\frac{(\text{std. ng})}{(\text{ul})} \frac{(\text{pk. height sample})}{(\text{pk. height std.})} \frac{(\text{vol. std. injected})}{(\text{vol. sample injected})} \frac{(2)}{(3)} \frac{(5\text{ml})}{(1000\text{ml})} (1000)$$

WRITTEN BY: Vincent Quan

TITLE: Agricultural Chemist II

APPROVED BY: David Conrad

TITLE: Agricultural Chemist III

APPROVED BY: George R. Tichelaar

TITLE: Principal Research Chemist

APPENDIX B

RESULTS OF THE METHOD DEVELOPMENT AND QUALITY CONTROL ANALYSES FOR FENAMIPHOS, FENAMIPHOS SULFOXIDE,AND FENAMIPHOS SULFONE

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TABLE B-1. Method Validation Study for Fenamiphos: Water.

Analyte: Fenamiphos
Matrix: Water
Detection Limit: 0.1 ug/l

Lab: CDFA
Chemist: Vince Quan
Date: 10/15/87

CDFA Sample #	Lab Sample #	Results (ug/l)	Spike Level (ug/l)	Recovery %
001	456	0.5	0.5	100
002	457	0.5	0.5	100
003	458	0.5	0.5	100
004	459	0.5	0.5	100
005	460	0.5	0.5	100
007	462	5.3	5	106
008	463	6.5	5	130
009	464	6.5	5	130
010	465	6.5	5	130
011	466	6.5	5	130
013	516	1.8	2	90
014	517	1.7	2	85
015	518	1.7	2	85

TABLE B-2. Method Validation Study for Fenamiphos Sulfoxide: Water.

Analyte: Fenamiphos sulfoxide
Matrix: Water
Detection Limit: 0.1 ug/l

Lab: CDFA
Chemist: Vince Quan
Date: 10/15/87

CDFA Sample #	Lab Sample #	Results (ug/l)	Spike Level (ug/l)	Recovery %
001	456	0.6	0.5	120
002	457	0.7	0.5	140
003	458	0.5	0.5	100
004	459	0.5	0.5	100
005	460	0.8	0.5	160
007	462	5.2	5	104
008	463	3.2	5	64
009	464	5.6	5	112
010	465	5.6	5	112
011	466	5.2	5	104
013	516	2.0	2	100
014	517	2.0	2	100
015	518	2.2	2	100

TABLE B-3. Method Validation Study for Fenamiphos Sulfone: Water.

Analyte: Fenamiphos sulfone
Matrix: Water
Detection Limit: 0.1 ug/l

Lab: CDFA
Chemist: Vince Quan
Date: 10/15/87

CDFA Sample #	Lab Sample #	Results (ug/l)	Spike Level (ug/l)	Recovery %
001	456	0.5	0.5	100
002	457	0.6	0.5	120
003	458	0.6	0.5	120
004	459	0.4	0.5	80
005	460	0.8	0.5	160
007	462	4.7	5	94
008	463	2.0	5	40
009	464	4.5	5	90
010	465	5.0	5	100
011	466	4.9	5	98
013	516	1.9	2	95
014	517	2.1	2	105
015	518	2.1	2	105

TABLE B-4. Quality Control Limits for Fenamiphos Well Study.

Matrix	Percent Recovery $\bar{X}$	SD	LWL*	UWL*	LCL**	UCL**
Fenamiphos:						
Water	107	16.7	73	140	57	157
Sulfoxide:						
Water	109	21.8	65	152	43	174
Sulfone:						
Water	100	25.7	49	151	23	177

1.) UCL/LCL = $\bar{X} \pm 3$ SD, UWL/LWL = $\bar{X} \pm 2$ SD

* UWL/LCL = Upper and Lower Warning Limits
** UCL/LCL = Upper and Lower Control Limits

TABLE B-5. Quality Control Data for Fenamiphos.

Analyte: Fenamiphos
Matrix: Water
Detection Limit: 0.1 ug/l

Lab: CDFA
Chemist: Vince Quan
Date: 10/15/87

CDFA Sample #	Lab Sample #	Results (ug/l)	Spike Level (ug/l)	Recovery %
425-432	423	0.5	0.5	100
433-435	---	0.2	0.3	67
436-471	471	0.4	0.5	80
442-449	514	0.5	0.5	100
450-455	469	0.7	0.5	140
504-508	513	0.6	0.5	120
528-530	538	0.5	0.5	100
487-493	538	0.5	0.5	100

TABLE B-6. Quality Control Data for Fenamiphos Sulfoxide.

Analyte: Fenamiphos sulfoxide
Matrix: Water
Detection Limit: 0.1 ug/l

Lab: CDFA
Chemist: Vince Quan
Date: 10/15/87

CDFA Sample #	Lab Sample #	Results (ug/l)	Spike Level (ug/l)	Recovery %
425-432	423	0.6	0.5	100
433-435	---	0.2	0.3	67
436-471	471	0.9	0.5	180*
442-449	514	0.6	0.5	120
450-455	469	0.8	0.5	160
504-508	513	0.8	0.5	160
528-530	538	0.6	0.5	120
487-493	538	0.6	0.5	120

* Lab sample no. 471 fell outside the upper control limit (UCL) for sulfoxide of 174%.

TABLE B-7. Quality Control Data for Fenamiphos Sulfone.

Analyte: Fenamiphos sulfone
Matrix: Water
Detection Limit: 0.1 ug/l

Lab: CDFA
Chemist: Vince Quan
Date: 10/15/87

CDFA Sample #	Lab Sample #	Results (ug/l)	Spike Level (ug/l)	Recovery %
425-432	423	0.6	0.5	120
433-435	---	0.1	0.3	33
436-471	471	0.7	0.5	140
442-449	514	0.4	0.5	80
450-455	469	0.7	0.5	140
504-508	513	0.8	0.5	160
528-530	538	0.6	0.5	120
487-493	538	0.6	0.5	120

TABLE B-8. Split/Confirmation Analyses for Fenamiphos.

Analyte: Fenamiphos
Matrix: Water
Detection Limit (CDFA): 0.1 ug/l
Detection Limit (Cal Labs): 0.5 ug/l

Lab: CDFA
Chemist (CDFA): Vince Quan
Chemist (Cal Labs): Karla S.
Date: 10/15/87

CDFA Sample #	Lab Sample #	CDFA (ug/l)	Cal Labs (ug/l)
0025	433	<0.1	
0028	31236		<0.5
0058	434	<0.1	
0055	31236		<0.5
0130	447	<0.1	
0133			<0.5
0088	490	<0.1	
0097	31358		<0.5

TABLE B-9. Split/Confirmation Analyses for Fenamiphos Sulfoxide.

Analyte: Fenamiphos sulfoxide
Matrix: Water
Detection Limit (CDFA): 0.1 ug/l
Detection Limit (Cal Labs): 0.5 ug/l

Lab: CDFA
Chemist (CDFA): Vince Quan
Chemist (Cal Labs): Karla S.
Date: 10/15/87

CDFA Sample #	Lab Sample #	CDFA (ug/l)	Cal Labs (ug/l)
0025	433	<0.1	
0028	31236		<0.5
0058	434	<0.1	
0055	31236		<0.5
0130	447	<0.1	
0133			<0.5
0088	490	<0.1	
0097	31358		<0.5

TABLE B-10. Split/Confirmation Analyses for Fenamiphos Sulfone.

Analyte: Fenamiphos sulfone
Matrix: Water
Detection Limit (CDFA): 0.1 ug/l
Detection Limit (Cal Labs): 0.5 ug/l

Lab: CDFA
Chemist (CDFA): Vince Quan
Chemist (Cal Labs): Karla S.
Date: 10/15/87

CDFA Sample #	Lab Sample #	CDFA (ug/l)	Cal Labs (ug/l)
0025	433	<0.1	
0028	31236		<0.5
0058	434	<0.1	
0055	31236		<0.5
0130	447	<0.1	
0133			<0.5
0088	490	<0.1	
0097	31358		<0.5

TABLE B-11. Storage Dissipation Analyses for Fenamiphos.

Analyte: Fenamiphos
Matrix: Water
Detection Limit: 0.1 ug/l

Lab: CDFA
Chemist: Vince Quan
Date: 10/15/87

CDFA Sample #	Lab Sample #	Results (ug/l)	Spike Level (ug/l)	Recovery %	$\bar{X}$	SD
Analyzed on: 9/2/87						
1	509	2.2	2.0	110		
2	510	2.2	2.0	110		
3	511	2.4	2.0	120	113	4.7
Analyzed on: 9/15/87						
4	531	2.2	2.0	110		
5	532	2.1	2.0	105		
6	533	1.5	2.0	75	97	15.4
Analyzed on: 9/28/87						
7	534	2.2	2.0	110		
8	535	2.1	2.0	105		
9	536	2.1	2.0	105	107	2.3

TABLE B-12. Storage Dissipation Analyses for Fenamiphos Sulfoxide.

Analyte: Fenamiphos sulfoxide
Matrix: Water
Detection Limit: 0.1 ug/l

Lab: CDFA
Chemist: Vince Quan
Date: 10/15/87

CDFA Sample #	Lab Sample #	Results (ug/l)	Spike Level (ug/l)	Recovery %	$\bar{X}$	SD
Analyzed on: 9/2/87						
1	509	2.2	2.0	110		
2	510	1.9	2.0	95		
3	511	2.3	2.0	115	107	8.4
Analyzed on: 9/15/87						
4	531	2.8	2.0	140		
5	532	2.5	2.0	125		
6	533	2.0	2.0	100	122	16.4
Analyzed on: 9/28/87						
7	534	2.5	2.0	125		
8	535	2.5	2.0	125		
9	536	2.2	2.0	110	120	7.0

TABLE B-13. Storage Dissipation Analyses for Fenamiphos Sulfone.

Analyte: Fenamiphos sulfone
Matrix: Water
Detection Limit: 0.1 ug/l

Lab: CDFA
Chemist: Vince Quan
Date: 10/15/87

CDFA Sample #	Lab Sample #	Results (ug/l)	Spike Level (ug/l)	Recovery %	$\bar{X}$	SD
Analyzed on: 9/2/87						
1	509	2.0	2.0	100		
2	510	1.5	2.0	75		
3	511	1.8	2.0	90	88	10.2
Analyzed on: 9/15/87						
4	531	2.6	2.0	130		
5	532	2.5	2.0	125		
6	533	2.0	2.0	100	118	13.1
Analyzed on: 9/28/87						
7	534	2.3	2.0	115		
8	535	2.6	2.0	130		
9	536	2.6	2.0	130	125	7.0

Table B-14. Quality Control Data for Fenamiphos, Fenamiphos Sulfoxide and Fenamiphos Sulfone Blind Spikes: CDFA Lab

Analyte: Fenamiphos, sulfoxide and sulfone
Matrix: Water
Detection Limit: 0.1 ug/l

Lab: CDFA
Chemist: Vince Quan
Date: 10/5/87

CDFA Sample #	Lab Sample #	Results (ug/l)	Spike Level (ug/l)	Recovery %
192	435	0.4 fenamiphos	1 fenamiphos	40
192	435	0.5 sulfoxide	0 sulfoxide	-
192	435	0.1 sulfone	0 sulfone	-
200	564	<0.1 fenamiphos	0 fenamiphos	-
200	564	1.8 sulfoxide	2 sulfoxide	90
200	564	<0.1 sulfone	0 sulfone	-

Table B-15. Quality Control Data for Fenamiphos, Fenamiphos Sulfoxide, and Fenamiphos Sulfone Blind Spikes: Cal Labs

Analyte: Fenamiphos, sulfoxide and sulfone
Matrix: Water
Detection Limit: 0.5 ug/l

Lab: Cal Labs
Chemist: Karla S.
Date: 10/5/87

CDFA Sample #	Lab Sample #	Results (ug/l)	Spike Level (ug/l)	Recovery %
190	31236-7	<0.5 fenamiphos	1 fenamiphos	0
190	31236-7	0.8 sulfoxide	0 sulfoxide	-
190	31236-7	<0.5 sulfone	0 sufone	-
191	31236-8	<0.5 fenamiphos	0 fenamiphos	-
191	31236-8	1.3 sulfoxide	2 sulfoxide	65
191	31236-8	<0.5 sulfone	0 sulfone	-